

SOL Technology Initiative

Report on the Demonstration Phase

Virginia Department of Education

Division of Technology

Division of Assessment and Reporting

July 2001

Purpose:

This document provides a summary of the Demonstration Phase of Virginia's Web-based Standards of Learning (SOL) Technology Initiative. For additional information regarding the entire Web-based SOL Technology Initiative, please refer to the following Web site:

<http://www.pen.k12.va.us/VDOE/Technology/soltech/soltech.html>

Background:

The Standards of Learning Technology Initiative is a large-scale project to improve student achievement across the Commonwealth using technology resources. The 2000 Virginia General Assembly approved the initiative, forwarded by the Governor, that provides funding to schools for the development of an array of web-based instructional and remedial programs, including online delivery of high school SOL tests.

Using a phased approach to undertake the task of implementing statewide online SOL testing, the Virginia Department of Education (DOE) planned and implemented a formal demonstration phase. A primary goal of this demonstration phase was to show the viability of delivering online SOL tests in Virginia. By having a small number of high schools prepare for and implement various SOL tests online, the DOE would demonstrate the concept of online testing while also gaining a clearer understanding of the technical and assessment issues associated with delivering high stakes tests electronically over the Internet. A set of minimum technical specifications needed for online testing would be developed based upon this demonstration, and the DOE, along with a number of Virginia teachers, administrators, and students, would have the opportunity to experience online test delivery systems.

In order to complete the demonstration phase, a number of events needed to be carefully planned and executed. The DOE coordinated a collaborative effort by many teachers, administrators, and students, along with selected vendors and various professionals from the fields of education and technology. The demonstration phase consisted of the following major events:

- ♦ Announcement of the Web-based SOL Technology Initiative demonstration phase.
- ♦ Posting of the online testing Request for Proposals (RFP).
- ♦ Evaluation and selection of vendor proposals for the demonstration phase.
- ♦ Identification and preparation of demonstration sites.
- ♦ Implementation of online SOL testing.¹
- ♦ Evaluation and analysis of the resulting online test delivery systems.
- ♦ Selection of online test delivery system(s) for statewide implementation.

A more specific explanation of these events and their outcomes is presented throughout the remainder of this document.

¹ Only students previously having passed the specific SOL test being administered or not having to take the specific SOL test being administered were able to participate in the online testing. Previously released SOL test items were used, and the test scores resulting from these demonstration tests were not permanently recorded. The scores were used only as hypothetical data to show the online reporting capabilities of the testing software and served no purpose beyond the demonstration phase.

Demonstration Phase Announcement:

On August 25, 2000, State Superintendent of Public Instruction, Dr. Jo Lynne DeMary, announced the beginning of the Web-based SOL Technology Initiative demonstration phase and extended an invitation to all Virginia school divisions to nominate one high school to participate in the online delivery of simulated SOL tests. A total of 57 school divisions responded by submitting a letter nominating one of their high schools to take part in this initial step toward online testing in Virginia. These school divisions agreed to provide staff and student participants, as well as any additional support needed to conduct a demonstration of online SOL testing at their specific high school.

Request for Proposals:

To begin the demonstration phase, the DOE developed and posted an RFP² asking vendors to propose a turnkey solution for online SOL testing. The turnkey solution requested would be implemented as part of the demonstration phase. It would include secure test delivery software, training and support for the software, conversion of previously released SOL items into an online test format, reporting of online test results, and provision of any associated infrastructure and equipment needed to demonstrate online delivery of the SOL tests.

Vendors were asked to develop a proposal where four specific end-of-course SOL tests would be administered to four different fictitious high schools. The individual profiles of these fictitious high schools were created by the DOE to mirror the range of currently existing high schools in Virginia and were provided in detail for the vendors within the RFP. This type of scenario within the RFP enabled vendors to present how their turnkey solution would address the many differences in Virginia's high schools, while it also maintained a degree of similarity among the vendor proposals for evaluation purposes.

On Friday, October 12, 2000, the RFP was published in various newspapers, on the DOE Website, and in the Virginia Business Opportunities listing (currently known as the Virginia Procurement Pipeline). Vendor proposals were due back to the DOE in Richmond, Virginia no later than 3:00pm on Monday, November 13, 2000.

Evaluation and Selection of Proposals:

A variety of vendors, some collaborating with one another, submitted a total of eleven proposals on November 13, 2000. In order to conduct a fair and thorough evaluation of all proposals, the DOE formed an independent evaluation committee consisting of assessment, instruction, and technology professionals with experience in Virginia school divisions, and statewide and national organizations. The committee reviewed all proposals independently and then convened at a neutral site in Richmond, Virginia to discuss the proposals and complete an extensive evaluation of the 11 proposed solutions (Refer to Appendix A:

² Available online at <http://www.pen.k12.va.us/VDOE/Technology/soltech/soltech.html> under Vendor Resources.

RFP Evaluation Process). After 2 ½ days of deliberation, the evaluation committee adjourned its meetings and eventually recommended three specific vendors to proceed into the demonstration phase.

On December 4, 2000, the DOE announced its intent to award a contract to the three specific vendors recommended by the evaluation committee (“Notice of Intent to Award”³). Each of the vendors agreed to the terms of the contract, and a formal kick-off meeting was held in Richmond between DOE staff and each of the individual vendors.

Identification and Preparation of Demonstration Sites:

One goal of the initiative’s demonstration phase was to show successful delivery of online SOL tests in a variety of high schools across Virginia. The significant number of school divisions responding to the invitation to participate in the demonstration testing facilitated the completion of this goal. Each of the eight regions was represented multiple times within the 57 letters of nomination received by the DOE.

In order to conduct a fair selection of demonstration sites, the DOE formed an independent selection committee to assist in the site selection process. Committee members were selected who possessed knowledge of technology and had no connections with the specific school divisions. The DOE devised a rating system with which the committee rated the high schools and their school divisions based upon a number of different factors.

First, a broad geographic representation was desired, so it was decided that a minimum of one high school from each of the eight regions should be included. Second, the DOE recognized the need to include a variety of schools with respect to both size and technical capacity. Therefore, the other factors considered in site selection were student populations of the high schools, the number of SOL tests administered annually, and the existing technical capacity within the high school and school division. Nine high schools representing nine different school divisions were selected so that each vendor would work with three different high school environments. Telephone calls were made to the principals of each high school in order to confirm their knowledge of, interest in, and commitment to the SOL Technology Initiative demonstration phase. On December 18, 2000, the DOE posted a press release⁴ announcing the nine individual high schools selected to serve as demonstration sites (Refer to Appendix B: Demonstration Site Locations).

Implementation of Online SOL Tests:

After the selection of three vendors in early December 2000, the focus quickly shifted toward developing the online versions of the previously released SOL test items. The multiple choice test items needed to be displayed onscreen, and students needed to be able to easily navigate throughout the test. Each vendor

³ Available online at <http://www.pen.k12.va.us/VDOE/Technology/soltech/soltech.html> under Vendor Resources.

⁴ Available online at <http://www.pen.k12.va.us/VDOE/NewHome/pressreleases/dec1800.html>

solution showed one question at a time on the screen and required students to select an answer by clicking it with the mouse. Some solutions enabled students to use their keyboard to type the letter of the selected answer as an alternative to using the mouse. All solutions provided students with some form of navigation backward through the tests as well as the ability to skip a question and return to that item later. Two of the solutions allowed students to select an individual question in order to mark it for review. Later in the test, the student could easily identify those unanswered questions and return to them directly.

The four specific end-of-course tests that vendors were asked to present online included Earth Science, Geometry, English: Reading and Literature, and Chemistry. The DOE selected these specific subject areas due to students needing to use associated manipulatives and ancillary materials during these tests. Vendors were asked to provide a computer-based version of a four-function calculator, a graphing calculator, a ruler, a compass, a formula sheet, and the periodic table. The vendors experienced varying degrees of success in providing these materials online. Students commented that the graphing calculators did not have the same appearance as the calculators they were used to using. The online compass for the Geometry test seemed to be the most challenging tool for the student to become familiar with as well as for the programmers to create. The need for further consideration and refinement of the online tools required for SOL testing became quite clear throughout the demonstration phase.

While the three vendors worked to develop their online version of the SOL tests, they also worked closely with DOE and the school division staff to complete site evaluations, install any additional equipment or needed upgrades, plan staff and student training, and schedule the actual demonstration of student testing. Weekly conference calls were held throughout the demonstration period with each vendor, DOE staff, and staff from the vendor's three assigned high school demonstration sites. These calls enabled regular communications to occur among all involved while minimizing statewide travel as much as possible.

Training:

Beginning in mid-February 2001, vendors provided on-site training in the use of their testing software. Teachers and administrators participated in detailed training sessions at each demonstration location, and training was provided in a variety of modalities ranging from direct hands-on instruction, to online tutorials, to printed documentation. In addition to receiving training for their staff members, some schools asked their vendor to provide a basic overview of the online testing environment to parents, community members, and school board members.

The objectives of these training sessions varied depending on the roles of those being trained. Division directors of testing, school testing coordinators and building administrators received detailed training on how to schedule tests, assign students to specific test administrations, and manage student data. SOL test proctors received training in how to administer the online test to students and how to respond to student questions regarding the software.

Students received training in the form of online tutorials that could be taken at the time of the test administration or prior to the actual testing day. Students familiar with using a standard Internet browser

were quite comfortable navigating through the tests. Students were more challenged by being able to effectively use the manipulatives such as the online compass or online graphing calculator.

The high stakes nature of Virginia SOL testing demands that high quality training be provided to both school division personnel and students as they make the transition to an online testing environment. The DOE staff will work with the selected vendor to ensure the quality and effectiveness of all training associated with online SOL test delivery.

Scheduling and Test Administration:

Each vendor provided a Web-based solution for scheduling tests, adding students individually, selecting students for testing, adding test proctors, and accessing reports. While the three solutions varied significantly, all three worked with the two leading browser types (Internet Explorer and Netscape Navigator). A distinct advantage of this as cited by test coordinators was that they were able to do their work at home over the Internet. Administrators who used the scheduling and test administration portions of the software were generally enthusiastic about the ease of use and the ability to quickly schedule students and test administrations. Another valuable administrative feature was the ability to import student data into the testing software from a standard, defined data file that could be retrieved from most student information system exports. This import process would serve the same purpose as the currently used “pre-id file” labels placed on SOL answer documents.

As is the case in paper and pencil SOL testing, the individual high schools selected the location and number of rooms that would be used for the online testing. Some used all of their computer labs for online testing and completed the testing sessions in the shortest testing window possible. Other schools minimized the number of labs or computers required for testing, by extending the length of their testing window and completing test administrations in a smaller number of rooms or labs. These decisions were made locally at each school based upon the number of tests that would be administered, the number of available computers, and the preferred length of the testing window.

In an attempt to increase the number of potential testing locations within their schools, a number of the demonstration sites experimented with SOL testing in a wireless environment. A classroom set of laptops were stored in a mobile cart and were then delivered, or rolled, to the testing location. With one, properly segmented, switched 10/100mb Ethernet network connection⁵, a wireless access point was able to deliver the SOL tests online to the designated 25 to 30 laptops in the area. By installing a second battery in the expansion bay of each laptop, schools selecting this option could, in most cases, operate the laptops on battery power for the entire day. Cafeterias, library media centers, large conference rooms, and standard classrooms were among the types of spaces tried as testing locations during the demonstration phase.

⁵ BEFORE implementing wireless LAN technology, school divisions should refer to the DOE’s “Architectural Guidelines for High School Readiness” (available at <http://www.pen.k12.va.us/VDOE/Technology/soltech/docs/archguide.pdf>) and work with a reputable technology infrastructure company or specialist with proven experience in conducting site surveys for wireless technology, installing wireless technology, and integrating wireless LAN technology with existing cable infrastructure.

Varying levels of test administration control were provided by the three proposed online test delivery systems. A number of different methods for limiting the hours during which students could access the online SOL tests were demonstrated. One solution required an administrator to "start" and "stop" student tests from a computer logged into the administration software at the time of the test. Another solution restricted the hours during which individual logins could occur, while another required student input of a security key that randomly changed every 24 hours and was available only through a test administrator. In order to successfully login to begin their tests, one solution required students to enter their full name and correct birthday. Others demonstrated a method of using a printed "student test ticket" with a student's username and unique required password needed to access a test. The student test tickets were usually generated before the test and provided to the proctor in a sealed envelope along with a roster of students taking that specific test. In the case of a student not being pre-registered for a test, an administrator with appropriate access could enter the student's information into the system from any computer and immediately print a test ticket.

Technical Specifications:

Another significant goal of the demonstration phase was to establish a set of minimum technical specifications required for successful online testing. Information was needed regarding the type of desktop computers required, the amount of bandwidth needed, and any necessary local area network (LAN) or wide area network (WAN) specifications. The DOE collaborated with the vendors' technical staffs and an independent technical consultant to develop a set of "Preliminary Architectural Guidelines"⁶ based upon the combined requirements of the three proposed solutions. This document was made available in January 2001 to provide guidance to school divisions as they began their early preparations for the Web-based SOL Technology Initiative and Spring, 2003 online SOL testing.

After the completion of the demonstration project, a revised document entitled "Architectural Guidelines for High School Readiness"⁷ was published. The technical and minimum specifications required for online SOL testing are available in that document. Please refer to the "Architectural Guidelines for High School Readiness" available at the SOL Technology Initiative Web site at <http://www.pen.k12.va.us/VDOE/Technology/soltech/docs/archguide.pdf>.

Security:

Security of the testing environment was another critical issue considered throughout the demonstration phase. In many of the computer labs used for testing, the ease with which students could view the monitors of other students was problematic. Online testing, just as paper and pencil testing, required school divisions to take measures to ensure that students were unable to see other students' answers while taking the same test. In an environment using wireless laptops, students were easily positioned in ways that precluded them from seeing other monitors during the test. In situations where it was not feasible to change the arrangement of computers, some schools placed cardboard dividers between student workstations. Others taped heavy card stock, such as file folders, to the sides of the monitors during the test in order to

⁶ Available online at <http://www.pen.k12.va.us/VDOE/Technology/soltech/soltech.html> under School Division Resources

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limit visibility. Another effective solution successfully implemented during the demonstration phase was to use flexibility in scheduling students and proctoring tests so that not all students in a lab were taking the same test. Without the need for content specific test materials (test booklets, ancillary materials, etc.) to be in designated rooms at specific times, proctors were able to administer more than one type of end-of-course SOL test simultaneously in a given room. Students taking different tests could then be placed next to one another to minimize temptation and further minimize the potential of a student seeing another student's answers on the same test.

Security of the test content was addressed in varying ways by the different vendor solutions. At no time was test content physically stored on hard disks in computers and servers within a school or school division. Throughout the demonstration, test questions were stored on a secured server at a data hosting facility as sub-contracted by the vendor. In the future, SOL test content will continue to be stored only on secured servers in professional data hosting facilities. In addition, all test questions transmitted over the Internet will be encrypted, and the encryption key will be provided only after a student successfully authenticates on the hosting server.

Securing the desktop of the workstation during the testing window was mandatory and, as expected, presented another challenge for all three vendors. A student should not have been able to open other applications or view other Internet sites while taking a test. In each of the solutions, however, desktop security was compromised to some degree. In two of the solutions, students were able to easily visit other web sites while taking the test. In another instance, certain keystroke combinations allowed one user to open other applications, toggle between them, and paste actual screen shots of the test items into a printable document. The most secure solution demonstrated used a java application in order to access the SOL tests. This java application, compatible with a Mac or PC, functioned as a standard Internet browser to the end user but included integrated security for locking down the desktop and protecting any test materials. While online testing introduced many different challenges, test security, just as in the paper and pencil testing environment, required multiple levels of control and will continue to be a shared concern and ongoing discussion among schools, the DOE, and the vendor.

Reporting of Test Data:

As in any testing environment, the accurate reporting of test scores and test data is essential. The RFP included samples of the current DOE Standards of Learning test reports and required vendors to provide at least the equivalent information in their own reporting format. Vendors also were expected to provide a predefined data file of student answers that could be exported for scoring by an outside contractor.

One vendor was able to successfully report the student data accurately and in the required format. If given the appropriate access, administrators could view student test data via a standard browser over the Internet from any location. This data could be disaggregated in a number of ways using various on-screen sort features and could be printed, saved, or exported to a delimited text file. For the demonstration sites that were able to experience the full range of reporting capabilities, the reaction to the availability of data was extremely positive.

Reactions to Online Testing:

Overall, the student and teacher reaction to online testing was positive. In most instances, the students reported that the online test was faster (no tedious bubbling of the answer document) and less intimidating (seeing only one question at a time). Entering the answer to a question on the screen while viewing only that question, eliminated the potential for students to make errors when recording their answer to the answer document. A small number of students reported that they still preferred taking the test in the traditional paper & pencil format. Some of these feelings and comments, however, may be attributed to technical difficulties such as network slow downs that were experienced at some of the demonstration sites. Specific technical issues affecting performance are discussed in the “Architectural Guidelines for High School Readiness” and will continue to be discussed in the future as new hardware and software become available and further enhancements are released. Potential topics include, but are not limited to, bandwidth, LAN and WAN performance, appropriate network and proxy server configurations, and minimum computer specifications.

One of the more problematic aspects of online testing that became evident during the demonstration phase was the use of online calculators. In most cases, and with all three vendors, the calculator was more of a hindrance than a useful tool. Often, an online tool visibly blocked the test item. Once the online tool was opened, the student would have to move or minimize the tool in order to see the item or answer choices. Another problem was the lack of familiarity with the appearance of the online graphing calculator. None of the three vendor solutions presented a graphing calculator that resembled any that the students were familiar with. Seemingly detrimental to testing, many students remarked that they would prefer to simply have access to their hand-held calculator during testing and then answer the associated question online.

Vendor Selection:

In order to make a fair and informed decision regarding the online test delivery systems, the DOE utilized many resources throughout the demonstration phase. Each demonstration site project manager kept a log of communications, expenditures, and activities. All teachers and administrators involved in the demonstration phase were asked to complete an evaluation form that addressed the specific criteria of the original RFP. Proctors who administered the tests were able to electronically submit comments regarding their experience after the testing period. The student tests ended with a few questions regarding their experience, and students were also provided with the opportunity to submit comments. The information gained from the experiences of the demonstration sites has been and will continue to be extremely valuable as the SOL Technology Initiative continues.

In addition to the evaluations and feedback completed by the demonstration site participants, the DOE contracted with an independent consulting firm to provide a detailed technical review of the test delivery systems. The consulting firm thoroughly tested each solution on PC and Macintosh computers with a variety of operating systems and browser versions. A WAN engineer studied and provided feedback on the connectivity and transmission methods of each solution. Desktop security was tested and the formatting and accuracy of the resulting test data was also reviewed. The consultants met with each vendor and the DOE staff at the conclusion of the demonstration phase, but before completing their analysis, in order to clarify all outstanding issues and questions regarding any elements of the proposals.

All evaluative information was compiled by the DOE and utilized by various committees throughout the remainder of the analysis period. A very structured review process was completed collaboratively by those who were involved in the demonstration testing along with professionals who had reviewed all the evaluative information but had had no direct contact with any of the vendors throughout the demonstration phase. The DOE worked diligently to ensure a fair and equitable evaluation process was followed in order to obtain an objective recommendation for how to proceed with statewide implementation of online SOL testing (Refer to Appendix C: Final Selection Process).

Conclusion:

A primary goal of the demonstration phase was to show the viability of delivering online SOL tests in Virginia. This goal was achieved as many high school students, teachers, and administrators across Virginia experienced online SOL testing⁸ for the first time. While no single vendor provided a flawless product during the demonstration phase, the potential for using a browser-based application to successfully deliver Virginia's SOL tests online was confirmed.

A majority of the high school students responded positively to the new testing environment and provided valuable feedback for improving the testing software and the online testing process. Teachers and administrators were encouraged by the optimistic comments from the students and were pleased with the high level of comfort displayed by the majority of students using the test delivery software. The online reporting and disaggregation capabilities of the software were among a number of features highly praised by both teachers and administrators.

The DOE collected valuable knowledge and experiences throughout the demonstration phase and extends a very sincere thank you to the nine school divisions for their willingness to participate in the project. The technology and assessment specialists from each division along with the administrators and staff of the nine high schools gave willingly of their time to make this project possible and very successful. Their knowledge and professionalism, along with their patience and good nature made the demonstration phase enjoyable in addition to being valuable and successful. An additional thank you is extended to the students of the nine high schools who participated in the online SOL testing and provided their thoughts and feedback regarding the experience.

The DOE will continue to make information available concerning the Web-based SOL Technology Initiative at its Web site (<http://www.pen.k12.va.us/VDOE/Technology/soltech/soltech.html>).

⁸ Only students previously having passed the specific SOL test being administered or not having to take the specific SOL test being administered were able to participate in the online testing. Previously released SOL test items were used, and test scores resulting from these demonstration tests were not permanently recorded. The scores were used only as hypothetical data to show the online reporting capabilities of the testing software and served no purpose beyond the demonstration phase.

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APPENDIX A

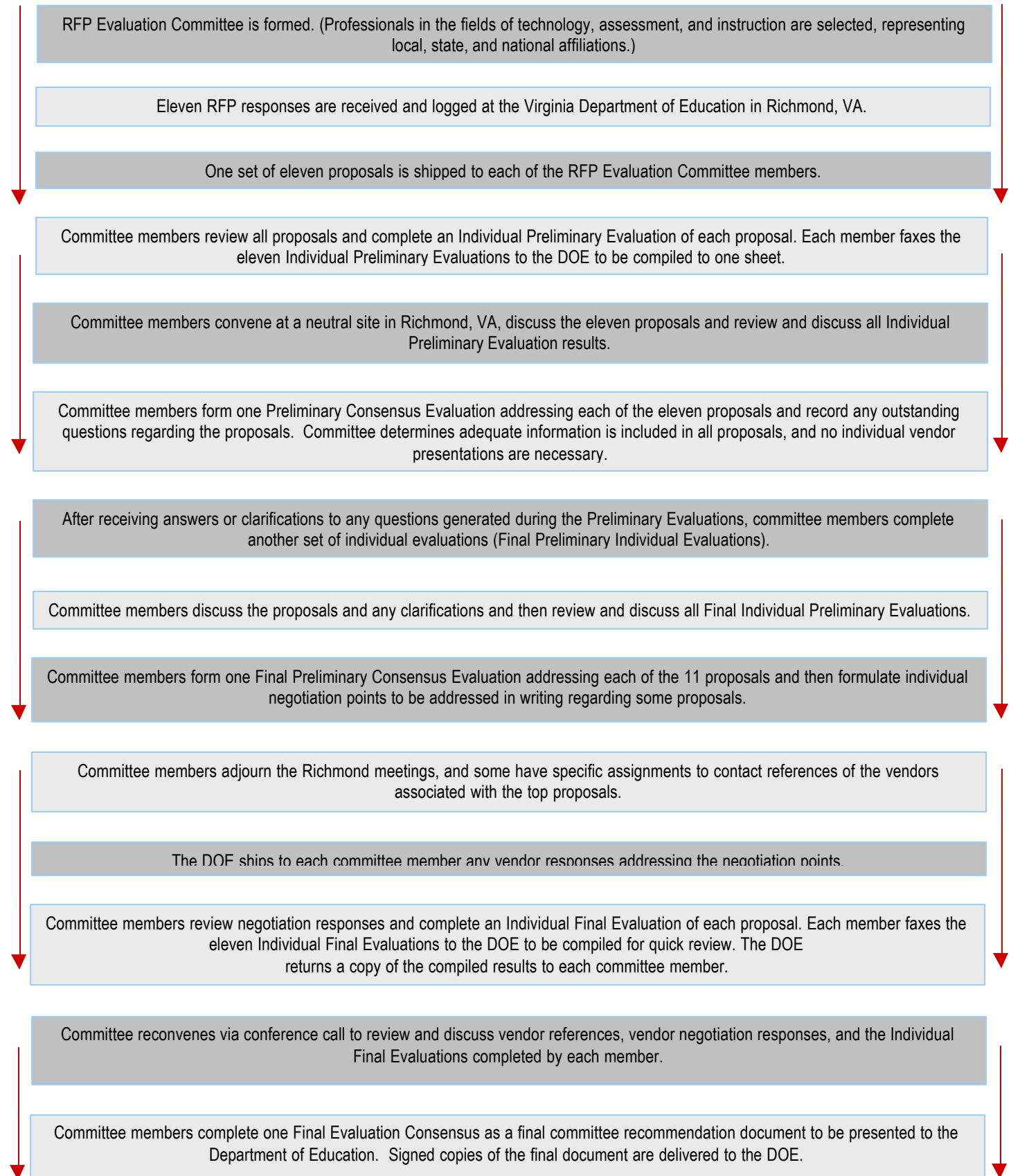
RFP Evaluation Process

The table below lists, as provided in the RFP, the individual categories and criteria upon which all proposals were evaluated.

Web-Based SOL Technology Initiative RFP Criteria

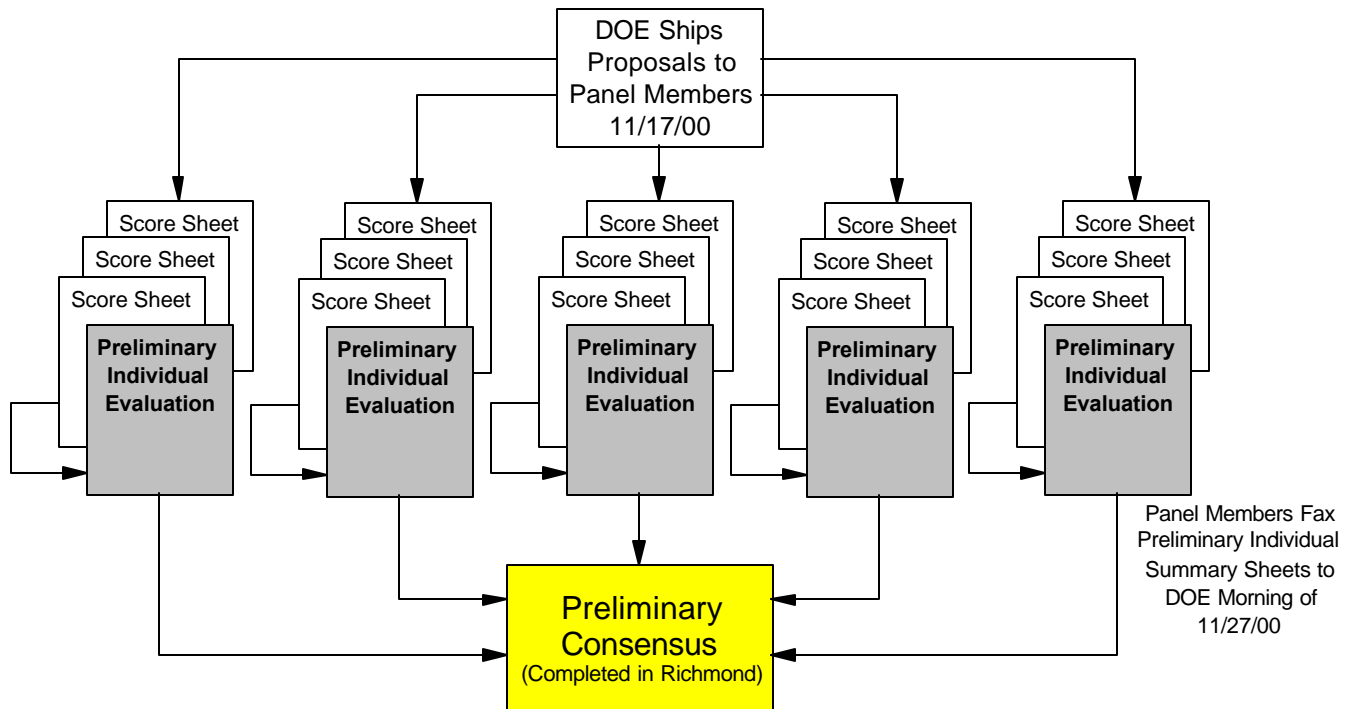
Evaluation Criteria
Scope of Work (Sections 1, 2 and 3) <ul style="list-style-type: none"> -- Comprehension of nature and scope of work involved <ul style="list-style-type: none"> - Provided evidence of a sound understanding of Virginia's education reform program -- Completeness and soundness of proposal -- Feasibility of the proposal to be implemented statewide -- Technical merit of methodology, procedures, and techniques Project Management <ul style="list-style-type: none"> -- Showed realistic and achievable project plan and timeline -- Evidence of knowledge of assessment program and interface requirements with the existing test contractor
Pricing (Section 4) <ul style="list-style-type: none"> -- Mandatory Pricing Table; One-Time Investment and Statewide -- Optional Pricing Table; One-Time Investment and Statewide -- Relationship of Offeror's Bid to the Lowest Proposal Price Received¹ (200 points) -- Value-Added Solution
Qualifications of the Offeror for Providing: (Sections 5 and 6) <ul style="list-style-type: none"> -- Ability to meet the terms of the RFP -- Ability to meet General Requirements and Special Terms and Conditions -- Quality of deliverables
Quality of Assigned Personnel <ul style="list-style-type: none"> -- Related company and individual experience -- Professional qualifications/technical competencies -- Commitment of sufficient personnel to the project -- Reference from other clients for whom the Offeror has provided similar services
Ability to Collaborate on Testing, Scoring and Reporting Services <ul style="list-style-type: none"> -- Ability to work with Test Contractor, Harcourt Educational Management -- Evidence of quality control procedures -- Inclusion of required elements -- Efficiency in providing reports
Participation of Small, Women-Owned, and Minority-Owned Businesses

An Overview: The SOL Technology Initiative RFP Evaluation Process

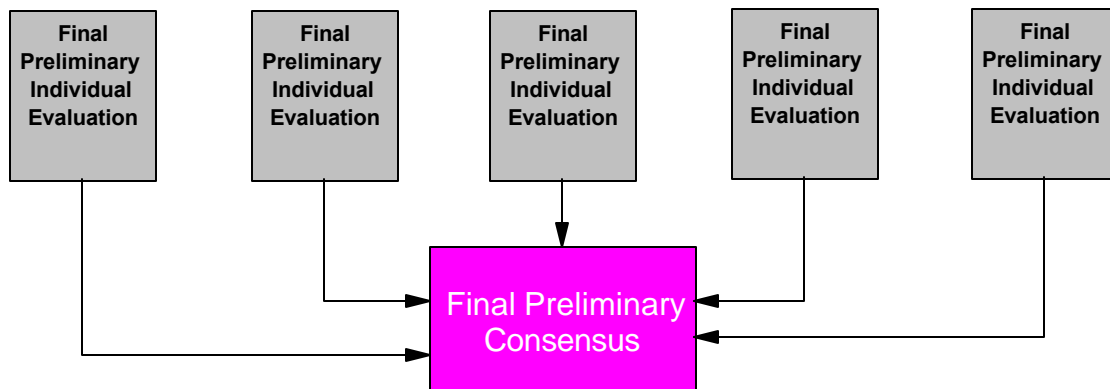


Virginia's Web-based SOL Technology Initiative

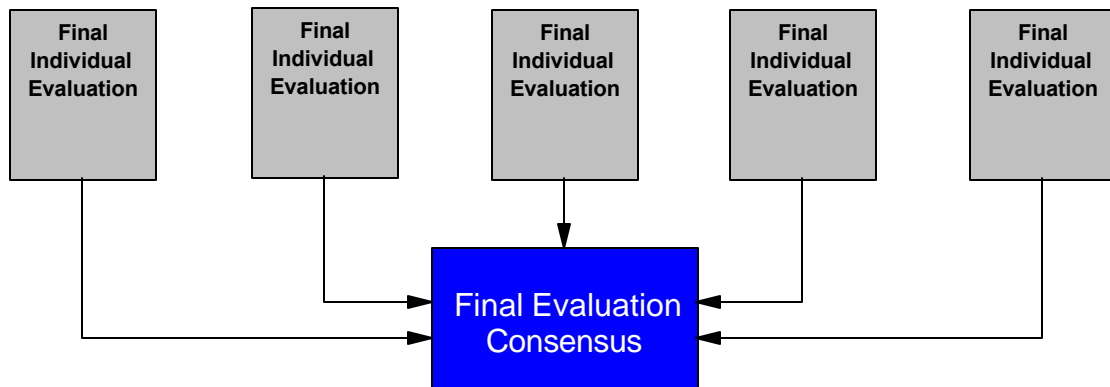
RFP Evaluation Process



Clarification of Outstanding Questions



Written Negotiation Responses and Vendor Reference Checks

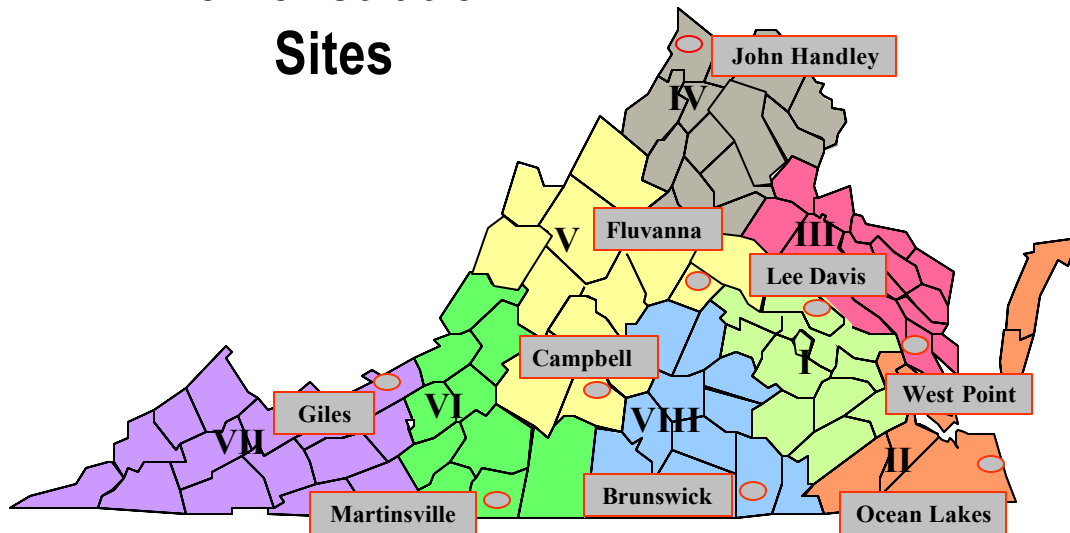


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APPENDIX B

Demonstration Site Locations

Demonstration Sites



Brunswick County Public Schools
Brunswick Senior High School
 2171 Lawrenceville Plank Road
 Lawrenceville, Virginia 23868

Martinsville City Public Schools
Martinsville High School
 351 Commonwealth Blvd.
 Martinsville, Virginia 24112

Campbell County Public Schools
William Campbell High School
 PO Box 7, 474 William Campbell Drive
 Naruna, Virginia 24576

Virginia Beach City Public Schools
Ocean Lakes High School
 885 Schuman Drive
 Virginia Beach, Virginia 23454

Fluvanna County Public Schools
Fluvanna County High School
 Rt 1, Box 480, State Rte 649
 Palmyra, Virginia 22963

West Point Public Schools
West Point High School
 2700 Mattaponi Avenue
 West Point, Virginia 23181

Giles County Public Schools
Giles High School
 PO Drawer G, 1825 Wenonah Avenue
 Pearisburg, Virginia 24134

Winchester City Public Schools
John Handley High School
 PO Box 910, Handley Boulevard
 Winchester, Virginia 22604

Hanover County Public Schools
Lee-Davis High School
 7052 Mechanicsville Pike
 Mechanicsville, Virginia 23111

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APPENDIX C

Final Selection Process

SOL Technology Initiative Final Vendor Selection Process

